

ON SOME MESOZOIC FOSSILS.

By C. W. De VIS, M.A.

PROMINENT in an interesting collection of fossils made and liberally presented to the Museum by F. L. Berney, Esq., R.A.O.U., of Wyangaria, I find more than one of so much promise that I am tempted to accept from them, as intermediary, whatever information they have to impart to the branch of science whose concern they are. I cannot persuade myself to pass on without venturing to pledge to Mr. Berney thanks other than "mine own" for his painstaking appreciation of the value to knowledge of relics of past life, an intelligent appreciation unhappily too exceptional. Would that more than the very few among the dwellers in our wilds at present known would help us onwards by utilizing to similar good purpose similar opportunities! Wyangaria is a station in the neighbourhood of Richmond and Hughenden, approximately in lat. 121, long. 143, more precisely on O'Connell Creek, one of the headwaters of the northward flowing Flinders River.

There is presumptive evidence of the age of the fossils in question, in the fact of their occurrence on an area of that formation which has been traced so far and wide over the surface of Northern Queensland, the Rolling Downs or Lower Cretaceous, conclusive testimony from the familiar fauna associated with them —e.g., *Ichthyosaurus australis*, *Belemnites canhami*, *Aurella hughendensis*. Of the exact stratigraphical position of the beds containing them, I am uninformed. From the almost entire absence of fracture surfaces upon them, and the bold relief of their enclosed organisms, it seems allowable to suppose that they have been weathered out of beds which possibly have disappeared. The rock is a rather thin-bedded, highly calcareous marlite, disintegrated with brisk action by hydrochloric acid, and leaving, after solution of its lime, a copious residue of ferruginous alumina. Internally it is fine-grained, hard, very tough, and darkly coloured by iron oxide; superficially it has, by partial loss of constituents, been rendered

softer, more flaky under the chisel, and, by hydration of the iron salt, impure yellow in colour.

Regretting that I am unable to give a more satisfactory account of the environment of the fossils at burial, I proceed to submit them to notice individually. The first, in the form of a Cycad, will, perhaps, appeal more especially to the interest of the palæobotanist.

CYCADAIFÆ.

Across the surface of one of the slabs lies the inorganic cast of a section of an apparently cycadaceous stem, 7 inches (177mm.) in length, and in breadth varying from 3 inches (76 mm.) at the base to $1\frac{1}{2}$ inch (38 mm.) at the apex. The stem is flattened, so greatly, indeed, that its basal section has the form of an elongated triangle, with its very obtuse angle replaced by a deep excavation, the termination of a tubular cavity in the heart of the stem. The lower half of the medullary cavity is empty, or nearly so; its upper moiety is still occupied by its converted medullary tissue distinguished by its colour from the adjacent ligneous and cortical layers, which, in their present denuded condition, of course, present no surface whereon foliation cicatrices could be preserved. Accompanying the stem there is not a trace of organic matter visible, unless it be, as be it may, that a black substance scattered over the slab, and distantly simulating dendritic manganese, represents the carbonaceous remains of decayed foliage. It is possible that this seeming fossil stands in peril of being condemned out of the category of extinct plants, on the ground that it is but a pipe in the rock filled up with sediment. I believe that cases of the kind have occurred. But what if it could be shown in the present one that Cycads were either growing or deposited on the same spot at the same time? Would not the recognition of the organic origin of this "stem" be then justifiable? As this evidence of the correctness of the view taken of it here is merely concealed by $1\frac{1}{2}$ inch of sediment, we have but to turn the slab over to find it in the form of a plant of well-known but, under the circumstances, an unexpected genus.

PTEROPHYLLUM MUCRONATUM, n.s.

Pl. ii, figs. 1 and 2.

The survival of the long-lived and prolific genus *Pterophyllum* to Cretaceous times is attested by the generic characters of part of

a frond bearing strap-shaped pinnules which, set at right angles to the rachis, are decurrent, separate, alternate, attached to the rachis by the whole base, and have veins parallel to each other and to the margins of the pinnules; furthermore by its appearance among Mesozoic fossils.

Spec. Char.—Pinnules long, four times as long as broad, apices mucronate by truncation in an upwardly curved direction, pointed; bases slightly contracted; veins 10 to 12 in number; rachis narrow, not striated, the part in sight not attenuated.

The veining is preserved on the bases of several of the lower pinnules, but in a condition which renders it somewhat difficult to ascertain their number precisely. I cannot, however, count more than twelve.

It is generally understood that the *Pterophylla* became extinct in the Jurassic period. The only hint to the contrary that I can find in literature available to me is the *P. ernestina*, Stiebt, and the right to a place in the genus claimed for this plant is, according to Schimper, dubious. The rock on which the pinna is displayed is in all respects identical with the matrix of the fossils accompanying it. If the foliage and the stem belong to the same species, as indeed seems more than probable, this Cretaceous *Pterophyllum* fails to show that the genus was even then represented by a decadent species.

The righteous protest uttered by Professor Forbes, in his Presidential Address to the Geological Society in 1854, against "rolling in the catalogue of new types morsels" of plants should be borne in mind whenever the temptation to do so is felt. But in the present instance the identity of the genus is so obvious, the specific novelty rendered so probable by the extreme rarity, if not absolute want, of previous discovery of *Pterophyllum* in the Cretaceous flora, that I feel justified in proposing for the plant a distinctive name.

NOTOCHELONE COSTATA, Owen.

Pl. iii, fig 1; Pl. iv.

Thirty years have nearly elapsed since Sir Richard (then Mr.) Owen described, under the name *Notochelys** *costata*, part of the carapace and plastron of an extinct Australian Chelonian. Since the date of that description, 1882, nothing more, so far as I am

* Subsequently changed to *Notochclone* by Mr. Lyddeker.

aware, has been made known respecting this reptile. It is therefore with great pleasure that I find myself in a position to make some little addition to our knowledge of its structure, provided always that co-identity between the type and its supposed co-types can be established. The type was said to be from the Flinders River, but the result of subsequent inquiry was the information that it had been sent to Sydney from Landsborough Creek, one of the primary affluents of the Thomson River, whose southerly directed water-course joins that of the Barcoo River, and with it loses itself further south. The watersheds of the two rivers, inclining in opposite directions, are separated by so scanty a breadth of upland—if barely rising ground may be so called—that the distance of Landsborough Creek from O'Connell Creek is but little more than 80 miles, a space of old sea margin too small to compel us to believe that the remains of a Chelonian found on the one are not likely to belong to the same species as those discovered on the other. On the contrary, it is, in the absence of hostile evidence, allowable to assume that any parts of a like reptile brought to light at O'Connell Creek are, by virtue of their proximity of location, specifically identical with *N. costata*, Ow., and on this understanding treat the two specimens illustrating its cranial features in youth and maturity.

THE IMMATURE SKULL: Pl. iii, fig. 1.—This is an imperfect cranium which, chiefly on account of its comparatively small size, appears to be that of a young individual. It presents to view nothing more than the exterior of the right side of a skull, extending from the anterior end of the maxillary to within the anterior slope of the tympanic antrum. Fortunate in its entombment, it has not been subjected to a depressing force acting on its roof, consequently whatever features it has wherewith to instruct us, these have remained vertically in their normal form. The temporal region is protected by bone, presumedly by a post-frontal 14 mm. in breadth. The orbit is not at this period of life of greater size than in the adult, being in length 45 mm., in height 20 mm.; its form would be represented by two parabolic lines, the lower one reversed and inversed. The sclerotic plates are in place, forming a rosette of six plates of unequal size. The most interesting feature in this subject, however, is the armature of the jaw, consisting of four stout compressedly conical and backwardly curved processes half an inch in length from the edge of the maxillary, with indications of a fifth anteriorly.

These pseudodonts, sheathed with horn, must have efficiently served a predatory tortoise in the capture of struggling victims. All traces of sutures have been lost from the surface of the specimen; nothing therefore can be ascertained of the interrelations of the bones posterior to the post-frontal. Its reverse is largely covered with broken bone, which probably formed part of the left side of the skull, but from these nothing is to be learned.

THE ADULT: Plate iv.—The rather sparse information supplied by the younger cranium we may perhaps find supplemented to a noteworthy extent by those characters of the adult which have been demonstrated by atmospheric and manual operations. When it came into my hands, weathering had already exposed the upper surface from the premaxillaries inclusive to the end, approximately, of the superoccipital spine; the parts thus made visible were the rostrum for the most part, the facial and anterior lateral regions, and the parietals as far back as the margins of the parietal vacuities appeared above the matrix. On the lower surface of the slab the contour of the lower jaw could be discerned through a thick coating of sediment. Development proved to be a tedious business owing to the toughness of the rock, an anxious one owing to the readiness of the soft bone to chip off in company with the firmly adhering matrix. It was interrupted by the slab proving itself unable to withstand continuous concussion by gradually falling apart in spite of clamping, and not resumed lest damage should be done to the exterior of the skull. The additional structures exposed are the post-frontal surface, the lower surface of the beak, the line of junction of the closed jaws, the tympanic antrum partially, the orbit partially, the mandible, and the palate sufficiently to show the position of the choanæ. In form the skull approaches to that of an isosceles triangle, whose longer sides are somewhat, but distinctly, contracted at a point situated rather less than half their length from the apex—in other words, the convexity of the snout, continuous with that of the rest of the skull, so commonly seen in marine turtles, is here absent. The size of the fossil is a matter of some interest in relation to the type of the genus. Its dimensions are:—Total length to the apparent end of the spine, not less than 195 mm.; greatest breadth across the parietals, 112 mm.; interorbital breadth, 60 mm. I perforce assume the correctness of Owen's estimate of the original length of his carapace, about 505 mm., and

venture to assume that the average of the proportion of skull to carapace in Chelonians may be found in recent turtles—for example, in *Chelone virgata*. In these I find them to be 1:4.7. Since the length of the *Notochelone* skull is at least 195 mm., it is thus proportionate to a carapace about 916 mm. long. Either then *Notochelone* had an enormously disproportionate head, or the type was not much more than half grown. For myself, I should prefer the latter alternative. It seems not improbable that the carapace and the younger of the skulls were of about the same age.

We have to thank an accident, resulting from superincumbent pressure, for an assurance of the existence of one important piece of internal structure, the fact of whose presence would have remained merely inferential. Resting on its mandible and, judging from the unequal level of that bone, with an inclination to the left side, the skull has yielded to the force applied to it from above. Anteriorly, as far back as the posterior limit of the frontal, it has been crushed down considerably below the level of the parietals. The parietals themselves, that of the left side especially, have within a short distance from the sagittal suture been split longitudinally, and bent downwards, but have escaped depression along a narrow space on each side of the mid line. This space was evidently upheld by the vertical walls formed by parieto-pterygoid plates. The lateral extent of the premaxillaries cannot, in the absence of sutures, be defined and, to my regret, their palatal relations have not been laid open. The rostrum is prolonged to a distance of 35 mm. from the anterior nares, and its terminal margin is but slightly, if at all, unciform. The edge of the maxillary is uniformly simple without a trace of processes dentiform or other in the part uncovered, though in uncovering it the greatest care was taken to avoid obliterating them had they been present. It would seem that we have here a case analogous to those noticed by Mr. Boulenger when wisely suggesting that the loss of the sharp-edged mandibles present in certain Chelonians when young, and their substitution by molariform alveoli in the adults may be accounted for by supposing it to be the result of a change from a carnivorous to a conchivorous diet. In the present case I am induced to submit that, if the absence of dentiform processes in the adult should be confirmed by subsequent acquaintance with *Notochelone*, it resulted, not from a change of diet but from an increase in muscular power. Objects of prey so elusive

as to be held securely only by the teeth of the comparatively feeble young or so large as to need piecemeal severance by them, would struggle in vain against the firmer grip of the adult jaw or be swallowed intact.

The anterior nares are flanked by an ascending process from the maxillaries and roofed over anteriorly by a pair of nasals. The nasals are short, 5 mm. fore and aft, with a transverse breadth of 27 mm. ; close to the orbit a tongue from them bends down to meet the maxillary process in a horizontal suture ; the prefrontals, 11 mm. long on their common suture and 26 mm. on the margin of the orbit, more than half of which they constitute, send down from their anterior angles a process which cuts off that from the nasals from the canthus orbitalis, and shares with it its junction with the maxillary ; the fronto-parietal suture was effaced by the down-thrust of the bone anterior to it, it has an approximate length of 15 mm. ; laterally it forms, as usual, the posterior margin of the orbit ; the deformed orbit is an elongate oval, 46 mm. in length, its vertical diameter reduced by pressure is 19 mm. ; sclerotic plates have so far not been divulged by removal of matrix to some depth ; the tympanic cavity, distorted and on its posterior margin somewhat obscure, appears to have been continuously surrounded by bone, no sign of an interruption in it is perceptible ; its present shape is that of an oval, 33 mm. long and 20 high, drawn out to a point on the upper part of its posterior end. In this skull also conditions do not favour the discrimination of the remaining cranial elements. The surface of the bone in both skulls is rather densely pitted, smooth, unimpressed by tegumentary scutes, unrelieved by reticulating ridgelets save that on one of the parietals of the adult there faintly appears a small patch of them.

Mandible.—The mandible in articular connection with the quadrates is apparently a member of considerable strength, 107 mm. in length, in span posteriorly 49 mm. While development between the rami was in progress the terminal part of the hinder end of the right one, though distant, became dislodged in so fortunate a manner that the form both of its own articular surface and that of the quadrate became ascertainable ; the former is, after adding to it a little left by it on the quadrate, seen to be convex, the latter concave. The end of the left ramus was found to have been broken into before burial with the result, long deferred, that the relics of

the inlet of the mandibular canal have been laid open to inspection. Occupying a place amongst them there is, strange to say if my interpretation of it be correct, a funicular body 3 mm. in diameter which can hardly be anything else than the common sheath of the dental nerve and its accompanying vessels filled with sediment. Into the canal itself no sediment has found access. In soft tissue, areolar or fibrous, when immersed in mud, prolonged immunity from decomposition or from destruction by living agents seems incredible. Recourse can be had to two conclusions only: the skull was buried immediately after death or mineralization was, under peculiar conditions, effected so rapidly that the foramen was closed against the ingress of sediment into the jaw itself. The symphyseal end of the bone is to all appearance greatly overhung by the upper jaw, but to an extent which might possibly be diminished by a complete removal of the matrix in front of it, in which case the length of the unsutured symphysis would be seen to be more than the 34 mm. now visible. The choanæ are situated between the tympanic cavities.

HIND LIMB: Femur.—The femur is instructively displayed on the upper edge of the fragment containing the younger skull. Its head indeed is buried in the rock, and unfortunately the space between the sides of the skull is too narrow to permit continuance of endeavour to bring it to light. It is, in fact, not quite certain that it remains to be found. The parts visible are the trochanters, the semi-circumference of the shaft, and, to a greater height above the matrix, the distal extremity. The great trochanter, of which the extent is easily traceable though the summit was found to be missing, was very much higher than the lesser and connected with it by a ridge crossing the valley between them. The shaft is cylindrical; as it descends from the trochanters it diminishes rather rapidly in breadth as far as the middle of its length, then increases and curves outwardly till it is lost in the articular dilatation. This is as usual thick, convex, without special areas of adaptation to the tibia and fibula. On the fibular side a portion of the bone is absent, but the entire edge of the fracture is visible. The dimensions of this bone will more conveniently be stated in conjunction with those of the segment following.

Tibia.—The distal long bones, half concealed, lie beside the adult skull, this and the long striated triangular depression on their ends, indicative of reptilian origin, are circumstances suggesting the

high probability that time was when the brain within the skull actuated these bones without it. The straight and rather slender tibia has the cylindricity of its shaft only marred by a very moderate flattening over the middle of its diameter and expands gently from about its mid length towards each terminal limit. Its articulating borders have the customary incrassation, convexity in both directions, and want of surfaces differentiated for articular requirements.

Fibula.—The fibular moiety of the segment is of still greater interest. It is considerably longer than the tibia, slightly broader at its proximal, nearly as broad at its distal end, and rather thicker in the shaft, which has so strong a curvature that the interosseous space equals its own remarkable diameter. The superior size of this bone is not without significance; its muscular investment must have been capable of communicating an unusually powerful outward sweep to a natatory foot.

The proportions, *inter se*, of these bones in their several dimensions may possibly tend to influence opinion respecting the zoological standing of *Notochelone*, and are therefore worthy of consideration. They may be most succinctly expressed in the tabular form subjoined:—

		NOTOCHELONE.	
		Measurements in mm.	Ratio to Length.
<i>Femur.</i>			
Length (from summit of great trochanter)		70	...
Minimum diameter		8½	1·8
Trochanterian width		23½	1·3
Distal width		22	1·3
<i>Tibia.</i>			
Length		72	...
Min. diam.		9½	1·8
Proximal width		18	1·4
Distal width		12	1·6
<i>Fibula.</i>			
Length		81½	...
Min. diam.		10	1·8
Proximal width		18	1·4
Distal width		12½	1·6·5

On the removal of matrix overlying the area immediately behind the distal ends of the long bones there appeared an osseous mass, denuded of its outer structure before burial, defined as to its horizontal limits by the exposed edges of that structure and without

similar indications of external surface dividing it fore and aft. Its anterior border lies in approximation to the ends of the tibia and fibula, and is scalloped opposite to their articulating surfaces; on the fibular side it extends outwards and slightly forward for the space of 5 millimetres. The posterior or distal edge describes while in a line with the leg bones a curve, which, commencing at the inner end of the anterior edge, is interrupted only by an emargination opposite the interosseous space; passing outwards it turns suddenly forwards and, with a procurved course, joins the anterior edge at an acute angle.* There does not appear to be any room for doubt that we have here a massive coalesced astragalo-naviculare.

The apparent preservation of soft tissue within the mandible naturally tends to confirm a suspicion already entertained that sundry patches of a thin dark-coloured substance lying flat on both sides of the slab may be remains of integument; two of them appear on the obverse, three on the reverse, the largest an irregular rectangle. All but one present a perfectly smooth exterior which may be supposed to be that of the outer aspect of the derm. The fifth, which apparently lies with its inferior surface upwards, is densely beset with minute papilliform tubercles, possibly dislodged from the pores opening on the surface of the bone. From the presence of these fragments it may perhaps be gathered that the head of the *Notochelone* was covered with smooth skin which, as we have seen, left on the bone beneath it no sign of its former existence.

A satisfactory discussion of the relations of *Notochelone* with the existing types of its order is simply impossible where the necessary literary help is not available in matters of research. In such circumstances one must be content with describing faithfully and as lucidly as one may whatever characters the subjects have appeared to possess and to leave to others better equipped to put them to a higher use. But it is almost equally difficult to leave a close examination of these relics without having acquired a general perception of their zoological standing, and even that may be worth stating.

The conclusion from which we can hardly escape is that this reptile is one of those generalized forms which set to the systematic zoologist so many problems difficult of solution, forms which cannot be without violence introduced into any extant family as constituted.

* Not indicated in the drawing.

It is as it were a panorama from which scenes and personages have been omitted and changed in the course of successive reproductions so that it has become impossible to say that any one of the latest of them is the lineal descendant of the original.

A FISH.

To other fishes from the Rolling Downs very imperfectly made known by the nature of their remains may be added an Acanthopterygian of considerable size, collected by Mr. Berney. The mere existence of this addition to our Cretaceous fish fauna is all that can be gathered from the four abdominal vertebræ which represent it, and as it is in much the same predicament as the Chirocentridan fish dismissed nameless by Dr. Woodward (*Ann. Mag. N.H.* 6 xiv p. 447) it may share the same fate. The neurapophyses and their spines are in their place and the ends of ribs from preceding vertebræ rest on the sides of those preserved. The four centra, which present no significant character superficially, are together 76 mm. in length; the anterior one is perforated centrally, in the posterior one the fact of its perforation is obscure; their diameters are at the anterior 42 mm., posterior 45 mm.

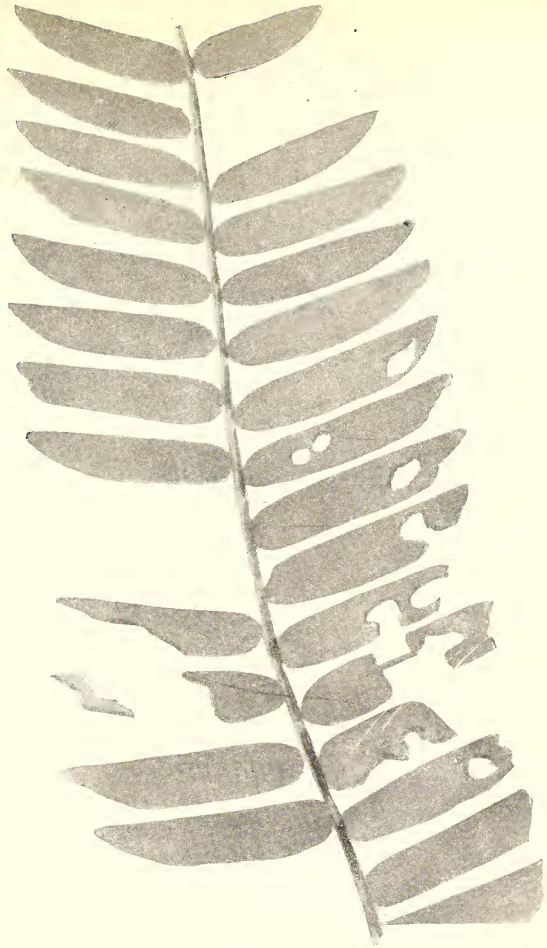


Fig. 1 (Natural Size).



Fig. 2

PTEROPHYLLUM MUCRONATUM, n.s.

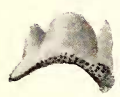


Fig. 3.

HYBODUS INCUSSIDENS.



Fig. 4.

PALEOLESTES GOREI, n.s.



Fig. 5.



Fig. 6.

(All Natural Size.)

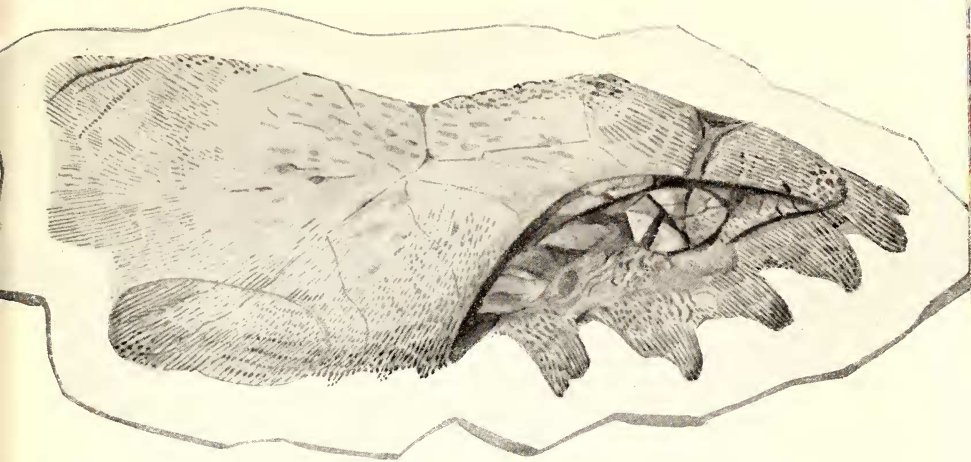


Fig. 1.—NOTOCHELONE COSTATA (Ow.). (Natural Size.)

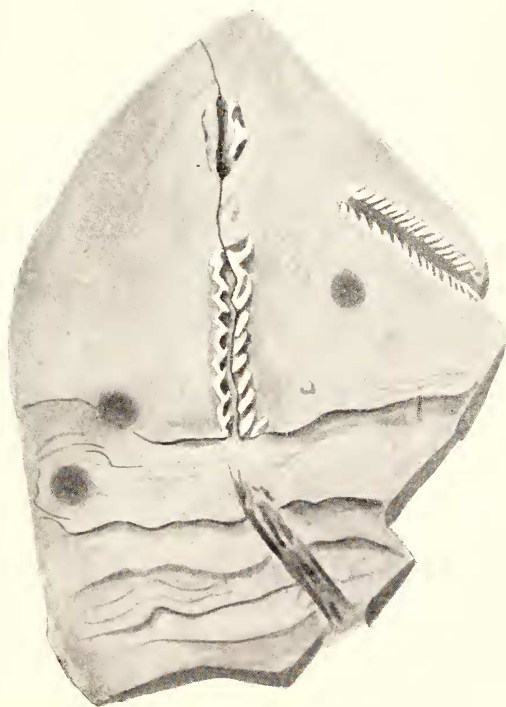
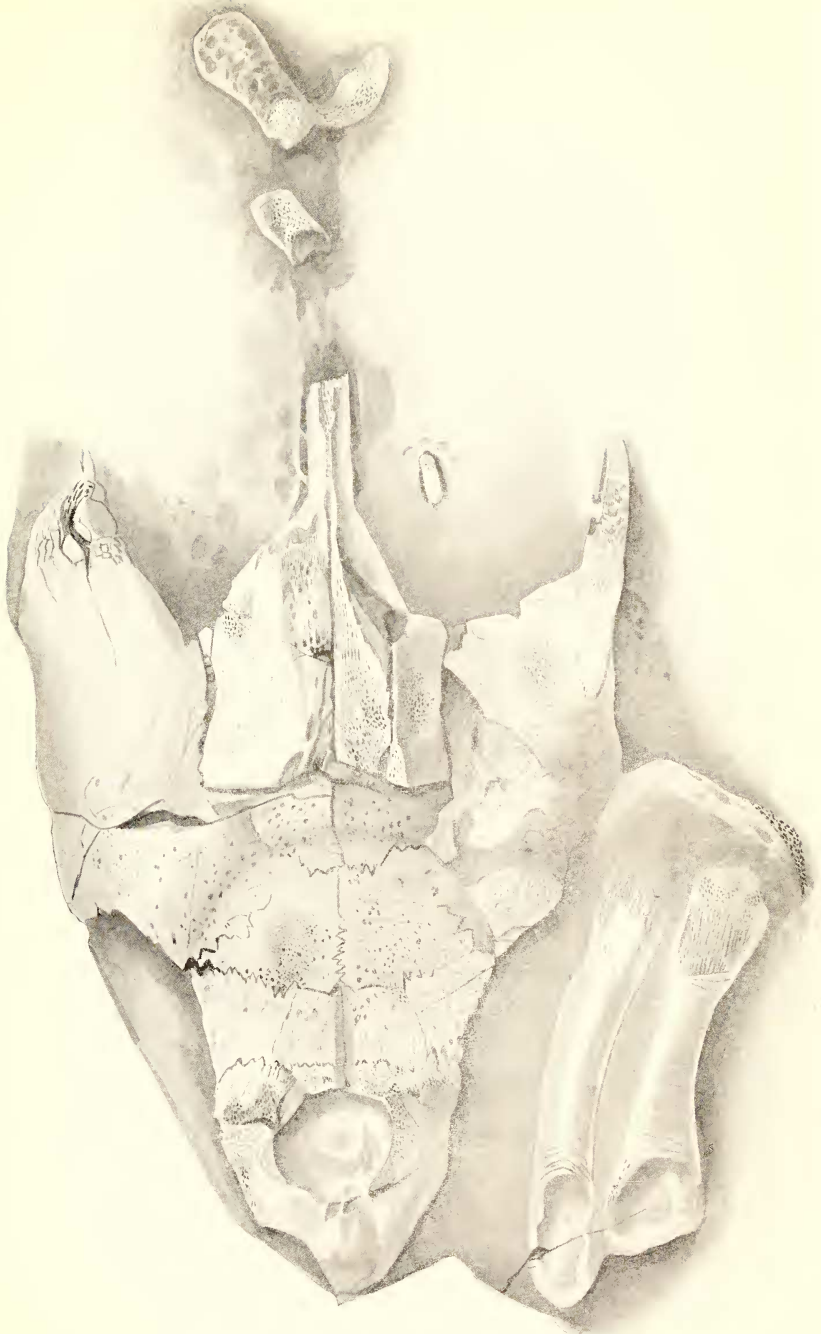


Fig. 2.—ANNELID TRAILS. (Natural Size.)



NOTOCHELONE COSTATA (OWEN).

(Two-thirds of Natural Size.)

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